SECTION 11 53 53
BIOLOGICAL SAFETY CABINETS

PART 1 - GENERAL

1.1 DESCRIPTION

This section specifies Biological Safety Cabinets: Class II, Type A2 and Class II, Type B2.

1.2 DEFINITIONS

Class II Biological Safety Cabinet: A ventilated cabinet for exposure protection of personnel, product and the environment, suitable for work involving low to moderate risk agents (BSL 1,2, and 3). Cabinet air is exhausted through a HEPA filter either into the laboratory or to the outside. Class II cabinets are available as two types (A and B) based on construction, air flow velocities and patterns, and exhaust systems. Refer to Table 1.

1.3 RELATED WORK

A. Refer to Biological Safety Cabinet Schedule on drawings. Refer to Laboratory Equipment Matrix: Division 11 for equipment tags, descriptions and other information (Equipment Matrix included for information only).

B. Division 01 Section “Summary” for requirements associated with Owner furnished products to be installed by the Contractor.

C. Division 01 Section “Summary” for requirements associated with Owner furnished and installed products that are work under other contracts.

D. Division 06 Section “Rough Carpentry” for wood blocking for anchoring equipment.

E. Division 09 Section “Gypsum Board Assemblies” for reinforcements in metal-framed gypsum board partitions for anchoring equipment.

F. Division 22, 26 and 27 Sections, as applicable, for connecting service utilities to biological safety cabinet. Piping and wiring within biological safety cabinets are specified in this Section.

G. Division 23 Sections, as applicable, for biological safety cabinet duct connections, including duct and exhaust fans.

H. Division 23 Section "Testing, Adjusting, and Balancing for HVAC" for field quality-control testing of biological safety cabinets connected to exhaust system.

1.4 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Biological safety cabinets, including attachments to other work, shall withstand the effects of earthquake motions determined according to SEI/ASCE 7 and the applicable Building Code requirements.

1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."
2. Seismic Design Criteria: Refer to Architectural drawings for design information and building code criteria.

1.5 QUALITY CONTROL

A. Product Designations: Drawings indicate sizes, types, and configurations of biological safety cabinet by referencing designated manufacturer's catalog numbers. Other manufacturers' biological safety cabinet of similar sizes, types, and configurations, and complying with the Specifications, may be considered. See Division 01 Section "Product Requirements."

B. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

C. Source Limitations: Obtain biological safety cabinets from single source, from single manufacturer.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

E. UL Certification: Provide electrical equipment and components that are evaluated by UL for fire, electrical shock, and casualty hazards according to applicable safety standards, and that are UL certified for compliance and labeled for intended use.

F. Pre-installation Conference: Conduct conference at Project site.

G. Mechanical, electrical and associated systems shall be safe, reliable, efficient, durable, easily and safely operable, maintainable, and accessible.

H. Standard Products: Material and equipment shall be the standard products of the selected manufacturer, and they should be regularly engaged in the manufacture of such products for at least 3 years.

I. All items furnished shall be free from defects that would adversely affect the performance, maintainability and appearance of individual components and overall assembly.

J. NSF Compliance: Equipment bears NSF (National Sanitation Foundation) Certification Mark indicating compliance with NSF 49.

K. Electrical Components and Devices: UL listed and labeled for intended use.

1.6 SUBMITTALS

A. Submit in accordance with specification Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, electrical characteristics, specialties and accessories.

C. Manufacturer’s Literature and Date: Include the following:

1. Illustrations and descriptions of the unit and factory-installed devices associated with it.
2. Catalog or model numbers for each item incorporated into the work.
3. Utility requirements.

D. Shop Drawings: For biological safety cabinets. Include plans, elevations, sections, details, and attachments to other work.

1. Indicate details for anchoring biological safety cabinets to permanent building construction including locations of blocking and other supports. Include calculations demonstrating that anchorages comply with seismic performance requirements.
2. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Show adjacent columns, beams, walls, doors, windows, ceilings, equipment and other building components.
4. Indicate locations and types of services together with associated service supply connection required.
5. Indicate duct connections.
6. Include roughing-in information for mechanical, plumbing and electrical connections.
7. Wiring Diagrams: For power, signal, and control wiring.

E. Samples: For each exposed product and for each color and texture specified.

F. Product Schedule: For biological safety cabinets. Use same designations indicated on Drawings.

G. Seismic Qualification Certificates: For biological safety cabinets, accessories, and components, from manufacturer.

H. Product Certificates: For each type of biological safety cabinet from manufacturer, certifying that products furnished comply with requirements.

I. Source quality-control reports.

J. Field quality-control reports.

K. Factory Testing: Provide manufacturer's QC checklist or other reports that indicate comprehensive factory testing has been performed, and the results of these tests.

L. Field Test Reports: Provide certification reports from accredited service technicians or installers.

M. Operating Instructions: Comply with requirements in specification Section 01 00 00, GENERAL REQUIREMENTS.

N. Software and Firmware Operational Documentation:

1. Device address list.
2. Printout of software application and graphic screens.

O. LEED Information:

1. LEED (v 3.0) MR Credit 4, Recycled Content: Product data indicating percentages, by weight of post-consumer and post-industrial recycled content for products having recycled content:
   a. Include statement indicating costs for each product having recycled content.
2. LEED (V 3.0) MR Credit 5, Regional Materials: Manufacturer's data identifying point of origin for products procured within 500 mile radius of the project:
   a. Include statement indicating costs for each product submitted.

1.7 PROJECT CONDITIONS

O. Environmental Limitations: Do not deliver or install biological safety cabinets until building is enclosed, wet work and utility roughing-in are complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

1.8 COORDINATION

P. Coordinate installation of biological safety cabinets with laboratory casework, fume hood exhaust ducts, and plumbing and electrical work.

1.9 WARRANTY

Q. Special Warranty: Manufacturer’s standard form in which manufacturer agrees to repair or replace biological safety cabinet that fail in materials or workmanship within specified warranty period.

1. Warranty Period: [3] years from date of Substantial Completion.

1.10 SOFTWARE SERVICE AGREEMENT

R. Technical Support: Beginning with Substantial Completion, provide software support for two years.

S. Upgrade Service: Update software to latest version at Project completion. Install and program software upgrades that become available within two years from date of Substantial Completion. Upgrading software shall include operating system. Upgrade shall include new or revised licenses for use of software.

1. Provide 30 days' notice to Owner to allow scheduling and access to system and to allow Owner to upgrade computer equipment if necessary.

1.11 EXTRA MATERIALS

T. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Filters: Full-size units; Two of each type and size required for each biological safety cabinet installed.

1.12 APPLICABLE PUBLICATIONS

A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.

B. American National Standards Institute / National Electrical Manufacturers Association (ANSI/NEMA):
WD 6-2002 (R2008).....Wiring Devices--Dimensional Specifications

C. National Sanitation Foundation International / American National Standards Institute (NSF/ANSI):
49-2009.....Biosafety Cabinetry: Design, Construction, Performance and Field Certification

D. Scientific Equipment and Furniture Association (SEFA):
2-2010.....Recommended Practices for Installation
7-2010.....Recommended Practices for Fixtures

E. National Fire Protection Association (NFPA):
45-2011.....Standard on Fire Protection for Laboratories using Chemicals

PART 2 - Products

2.1 MANUFACTURERS

A. Basis-of-Design Products: Subject to compliance with requirements, provide NuAire, Inc. products indicated below or comparable product by one of the following:

1. The Baker Company.
2. Labconco Corporation.

2.2 BIOLOGICAL SAFETY CABINETS – GENERAL

A. Description: NSF classified biological safety cabinet, class and type as indicated.

B. Features and Accessories: Provide the following, unless otherwise indicated for individual Class and Type specified.

1. Exterior: Cold rolled steel with baked powder coat finish or Type 304 stainless steel.
2. Interior Work Area: Type 304 stainless steel, with coved corners, spill trough with ball-type drain valve, and removable perforated stainless steel work surface.
3. Size: As indicated on Drawings.
4. Sash: Clear, tempered safety glass, 1/4-inch thick; fully closing, with two sash handles, counterbalance, anti-racking mechanism.
5. Sash Opening Height: As indicated on Drawings.
6. Control Panel: Touchpad controls for system manual operation of blower, lights, timer, audible alarm mute and menu selections.
7. Information Display: For cabinet status, alarm conditions, filter life remaining, timer and operating programs.
8. Airflow Monitoring: Visual and audible alarm; monitor inflow and downflow velocities and sash position; monitor exhaust air flow volume for cabinets connected to exhaust system.
9. Sound Level: 67 dbA or less in front of cabinet, when measured in accordance with NSF Standard #49.
10. Air Flow Velocity: Uniform downflow as defined by NSF Standard #49; nominal downflow 55 to 65 fpm; average nominal inflow 105 fpm.
11. Supply and Exhaust Filters: HEPA type filters; 99.99 percent efficient at 0.3 micron particle size. Protect supply HEPA filter with perforated metal diffuser.

12. Duct: Stainless-steel duct to direct air from the recirculation blower cabinet to the exterior. Refer to Section 23 31 00, HVAC Ducts and Casings.
13. Light Fixtures: Fluorescent lighting, providing 100 foot candles of non-glare illumination on the work surface. Ultraviolet lamp to be electrically interlocked to be inoperable while fluorescent lighting is "on."
14. Access panels, filter, motor, blower, and electrical components shall be accessible from the front of the cabinet, without disassembly of the control panel and sliding window tracks/hardware.
15. Exhaust Interlock: For cabinets connected to exhaust system, provide exhaust interlock system that prevents operation of internal supply blower unless exhaust flow is sufficient to provide proper air barrier inflow velocity at start-up.
16. Building Management/Automation System Interface: For cabinets connected to exhaust system, provide interface contacts for alarm conditions, night setback, fan/blower on/off and remote override.
17. Labels: Provide warning labels on front of cabinet requiring documentation prior to opening service panels or other interior access.
18. Base Stand: Adjustable height type unit with accessory shelf and leveling feet, unless otherwise indicated.
19. Piped Services: Equip unit for connection to services indicated on Drawings.

    a. Pre-pipe biological safety cabinet to 6-inch above topof biological safety cabinet. Piping shall be concealed within side panels. Refer to Division 22 Sections for piping materials for each type of service.
    b. Future Services: Pre-punched and plugged for future service connections.

c. Service Fittings: Comply with requirements in Division 12 Section "Laboratory Casework." Service fitting types as indicated on Drawings.

20. Equip with the following controls:
    a. On/off switch and circuit breaker with pilot "on" light for blowers.
    b. On/off switch for fluorescent lamps.
    c. Circuit breaker and on/off switch for duplex outlets.
21. Seismic Restraint

C. Locate HEPA filters and blower so that they are removable from the front without entry into workspace.

D. Equip with drain spillage trough in each unit. Provide ball valve and cap on trough drain outlet.

E. Equip with optional Intravenous (IV) bar, suspended across the top of the work area.

2.3 BIOLOGICAL SAFETY CABINETS, CLASS II, TYPE A2

A. Basis-of-Design Product:: NuAire, Inc.; Product – Cellgard ES Class II, Type A2 Biological Safety Cabinet, Model No. NU-480 Series.

B. Description: NSF Classification Class II, Type A2 Biological Safety Cabinet, 30-percent of air exhausted through HEPA exhaust filter, 70-percent of air re-enters work area through HEPA supply filter.

1. Sash Configuration: Sloped 10-degrees.
2. Accessories:

    a. UV germicidal light, interlocked with sash to operate only when the sash is closed.

3. Exhaust Connection Types:

    a. None, exhaust to room, unless otherwise indicated.

4. Electrical Services: Equip unit with plug and cord for 120V service.

    a. Provide one internal circuit for blower and lights, and one internal circuit for two duplex GFI receptacles with splash covers. Locate receptacles on interior back or side panels.

2.4 BIOLOGICAL SAFETY CABINET, CLASS II, TYPE B2

A. Basis-of-Design Product: NuAire, Inc.; Product – Labgard ES Class II, Type B2 Biological Safety Cabinet, Model No. NU-430 Series.

B. Description: NSF Classification Class II, Type B2 Biological Safety Cabinet, 100-percent of air exhausted through HEPA exhaust filter.

1. Sash Configuration: Vertical; except sash configuration with 10-degree slope is acceptable.
2. Accessories:

    a. UV germicidal light, interlocked with sash to operate only when the sash is closed.

    b. Provide sinks and plumbing connections as indicated on drawings.

3. Exhaust Connection:

    a. Hard-ducted with air-tight damper and air-flow sensor.

        1) Exhaust Canopy: Sealed, powder coated steel connection.
        2) Air-Tight Damper: Stainless steel, Type 304 damper.
        3) Duct Diameter: 12-inch.

    b. Exhaust Interlock: For cabinets connected to exhaust system, provide exhaust interlock system that prevents operation of internal supply blower unless exhaust flow is sufficient to provide proper air barrier inflow velocity at start-up.

c. Building Management/Automation System Interface: For cabinets connected to exhaust system, provide interface contacts for alarm conditions, night setback, fan/blower on/off and remote override.

4. Electrical Services: Equip unit with plug and cord for 120V service.

a. Provide one internal circuit for blower, one internal circuit for lights, and one internal circuit for two duplex GFI receptacles with splash covers. Locate receptacles on exterior jambs of sash opening.

2.5 MECHANICAL SERVICE FIXTURES

A. Valves, General Requirements:
1. Comply with requirements in SEFA 7.
2. Cast red brass alloy bodies with copper content not less than 81 percent, or drop forged brass alloy with high density and no porosity.
3. Locate valves so that they are accessible for maintenance and repair of internal working parts.
4. Equip valves with four-arm handles.
5. Design valves to withstand 689 kPa (100 psig) without leakage.

B. Gas, Air, and Vacuum Valves:
1. Provide floating needle valves with a replaceable cone and a replaceable valve seat.
2. Provide bonnet with exterior packing nut and packing gland designed for valve to be repacked while under pressure.

C. Outlet Fittings: Fit each outlet with a 10 serrated hose connector.

D. Electrical System: 115 V, 1 phase, 60 Hz.

E. Identification: Code valves with full-view plastic index buttons as follows:

Table 3

SERVICE	BUTTON COLOR	CODE	LETTER COLORS
Air	Orange	AIR	Black
Gas	Dark Blue	GAS	White
Vacuum	Yellow	VAC	Black

F. Finish:
1. Fixtures, Handles, and Escutcheons: Polished chrome plate.
2. Fixtures Inside Hoods: Acid- and solvent-resistant coating applied by fixture manufacturer.

G. Electrical Receptacles: Hospital-grade; ANSI/NEMA WD 6 Configuration 5-20R; duplex; with chrome-plated brass or stainless-steel cover plates; minimum 120 V, 20 A.

2.6 SOURCE QUALITY CONTROL

C. Factory Tests: Test and inspect each biological safety cabinet according to NSF Standard #49 “Performance Tests” article. Provide testing facilities, instruments, equipment and materials needed for test.

1. Where UV germicidal light is specified, provide documentation that installation does not affect performance of biological safety cabinet. Prepare source quality control test reports.

PART 3 – EXECUTION

3.1 PREPARATION

Install equipment after installation of finish flooring in rooms to receive cabinets has been completed.

3.2 INSTALLATION

A. General:

1. Locate unit away from fans, heating and air conditioning registers, laboratory hoods, high traffic areas and doors that could interfere with airflow patterns.

D. Install biological safety cabinets level and plumb, according to manufacturer's written instructions.

1. Connect equipment to utilities.
2. Securely anchor equipment to supporting substrate. Conceal anchorage where possible.
3. Complete equipment assembly where field assembly is required.

E. Install equipment with access and maintenance clearances that comply with manufacturer's written installation instructions and requirements of authorities having jurisdiction.

3.3 TESTING AND INSPECTION

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

C. Tests and Inspections:

1. Coordinate startup of equipment after service lines have been tested and balanced, and pressure, voltage and similar requirements have been properly adjusted.
2. Test each item to demonstrate that it is operating properly and that controls and safety devices are functioning. Repair or

replace equipment found to be defective in operation, including units that are operating below capacity or with excessive noise or vibration.

3. Field test installed biological safety cabinets according to NSF Standard #49 – Field Testing and the requirements of authorities having jurisdiction.

   a. Where biological safety cabinet are connected to exhaust system, adjust biological safety cabinet and building HVAC system, or replace biological safety cabinets and make other corrections until tested cabinet performs as specified.
   b. After making corrections, retest biological safety cabinets that failed to perform as specified.
   c. Coordinate field testing of biological safety cabinets with requirements of Division 23 Section "Testing, Adjusting and Balancing for HVAC."

D. Biological safety cabinets will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

3.4 PROTECTING AND CLEANING

A. After completing installation of equipment, repair damaged finishes.

B. Clean and adjust equipment as required to produce ready-for-use condition. Adjust hardware and moving parts to function smoothly, and lubricate as recommended by manufacturer.

C. Protect equipment from damage during remainder of construction period from dirt, water, and chemical or mechanical injury during the remainder of the construction period.

B. At the completion of work, clean equipment as required to produce ready-for-use condition.

3.5 INSTRUCTIONS

A. Engage a factory-authorized service representative to train Owner's laboratory and maintenance personnel to adjust, operate, and maintain biological safety cabinets.

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